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ABSTRACT

This book discusses semantic feature analysis, a strategy that helps teachers focus students' attention on vocabulary and increase their sensitivity to language. The first half of the book deals with the theoretical foundation, reviews the research, and describes the basic teaching strategy of semantic feature analysis. The book's second half is devoted to classroom applications of this knowledge, and includes semantic feature analysis in content area lessons, in reading instruction, in integrated reading/writing lessons, as well as a semantic feature database lesson. Twenty-one figures are included, and 71 references are attached. (SR)

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Feature Analysis

Reading Aids Series

SEMANTIC Feature Analysis

Classroom Applications

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Foreword

Semantic feature analysis is a strategy that helps teachers focus students' attention on vocabulary and the words we so often take for granted. By engaging students in discussions that elicit their experiences and associations with the concepts and words being highlighted, teachers help students increase their sensitivity to language. The shared analyses and debates make the study of language a cooperative endeavor.

Developing interest in language is an important priority for all teachers. Students who are sensitive to language will use it well; they think more precisely, understand others better, and communicate their own ideas more effectively. In his book *On Writing Well*, frequently used in college and graduate courses, Zinsser (1985) advises:

> Remember, then, that words are the only tools you will be given. Learn to use them with originality and care. Value them for their strength and their infinite diversity (p. 39).

This volume is a welcome companion to Heimlich and Pittelman's earlier book on semantic mapping. This time Pittelman and Heimlich, with Berglund and French, have provided us with a practical and thorough guide to using semantic feature analysis (SFA). The theoretical foundation, the review of research, and the description of the basic teaching strategy establish readers' knowledge of SFA. The second half of the book brings this knowledge to life in classroom applications.

The sample lessons illustrate the breadth of applications teachers have developed and use successfully. The classroom applications address concerns of teachers today: linking and building on prior knowledge, extending reading strategies across the content areas, applying effective reading strategies in literature and writing, and tying in computer applications. In addition, these classroom applications are presented in a way that makes them extremely useful. Teachers who have wondered how they could apply

semantic feature analysis in their own teaching situations should find their answers here.

The authors are to be congratulated for presenting SFA in such a helpful format. Semantic feature analysis is a powerful strategy to help us develop our students' love of and respect for our rich language.

Donna Ogle
National-Louis University

An Introduction to Semantic Feature Analysis

Semantic feature analysis (SFA) is an instructional strategy that capitalizes on the way information is stored by category in memory. The strategy has been used effectively in a wide variety of classroom situations, in school reading programs as well as in most other curricular areas. A versatile tool for vocabulary development, it can be used to extend, refine, and reinforce vocabulary in the content areas.

The SFA procedure requires students to draw on their background knowledge to understand the ways in which words within a category are alike or different. The features of these words are recorded in a matrix or grid, which makes the relationships among them readily apparent. This process leads students to an awareness of and an appreciation for the uniqueness of each word.

In this volume, we present a comprehensive introduction to this semantic-based classification strategy, along with detailed descriptions of eight classroom applications. A theoretical rationale for the strategy's effectiveness and a brief review of research findings are included.

The Role of Word Knowledge in Reading Comprehension

Educators have recognized the importance of word knowledge in reading comprehension since at least the 1920s (Albright, 1927; Hilliard, 1924; Pressey & Pressey, 1921). Davis (1944) performed a noted study in which word knowledge was shown to be the most important factor in reading comprehension. This finding was reaffirmed in the 1970s by Thorndike (1971) and by Spearritt (1972). Research in the 1980s confirms that vocabulary knowledge is critical for reading comprehension (Barrett & Graves, 1981; Hayes & Tierney, 1982; Johnson, Toms-Bronowski, & Buss, 1983; Mezynski, 1983; Nagy & Herman, 1987).

The emphasis on imparting new word knowledge as part of reading instruction is based in large part on the understanding that "comprehension is building bridges between the new and the known" (Pearson & Johnson, 1978, p. 24). The relationship between prior knowledge and reading comprehension is among the most important issues in reading research. Research suggests that background knowledge about a topic, particularly understanding of key vocabulary, predicts text comprehension better than does any measure of reading ability or achievement (Johnson, 1984; Johnston & Pearson, 1982). Simply put, the more readers know about the topic to be covered, the more likely they are to understand new material about the topic.

Comprehension no longer is viewed as simply deriving meaning from the printed page; it is seen as an interactive operation in which students process text information by integrating the knowledge and experiences stored in their memories with the words on the printed page (Anderson et al., 1985; Durkin, 1981; Pearson, 1984). Interaction between the reader and the text is a central aspect of the comprehension process. Reading must extend beyond the decoding of words and the literal level of understanding. Readers must take a more "active-constructive" role in comprehending (Pearson, 1985). Comprehension is enhanced when readers have a personal response to text based on their prior knowledge, the information suggested by the written language, and the context of the reading situation (Cook, 1986). If new concepts are to be learned, they must be related to concepts already mastered.

According to schema theorists, everything a person encounters or learns is stored in the brain in cognitive structures or categories called schemata (Rumelhart, 1980; Rumelhart & Ortony, 1977). Schemata refer to the associations you make or the images you visualize when you hear or read a word or a sentence. When you hear the word *dog*, for example, it is unlikely that a dictionary definition flashes through your mind. Instead, you activate your schema for dog, which might include a dog's activities (barks, bites, jumps, licks, fetches, wags tail); its description (furry, four-legged, warm tongue, moist nose); or its characteristics (loyal, dangerous, loving). Your concept also might include other terms or images such as collie, terrier, dachshund; Fido, George, Spot; bone, leash, rabies. Your organized schema categorizes everything you know about dogs.

These schemata, which serve as semantic frameworks for related concepts, are incomplete. They are constantly being expanded, restructured, and fine-tuned as new information is received (Pearson & Spiro, 1982; Rumelhart, Lindsay, & Norman, 1972). The brain attempts to relate each new experience to one or more schemata. For example, when a person reads about, sees pictures of, listens to, or attends a concert, each ex-

perience adds to the schema for concert. All of these experiences help to develop meaning. According to this view, people do not learn isolated vocabulary words; instead, they develop increasingly complex schemata surrounding each word or concept.

The brain is continually categorizing and recategorizing information (Carnine, 1990). One way people cope with the environmental stimuli with which they are bombarded is to organize information into categories (Collins & Quillian, 1969, 1970). These categories represent an integration of external stimuli with the concepts or schemata in memory. The meaning of a new word can become known by including it in a category with other known words that represent the concept of the new word's meaning (Gipe, 1979). When introduced to a new stimulus, we automatically try to identify it by relating it to something familiar. We create categories to assimilate new information, relating it to cultural background, past experiences, and prior knowledge. For example, although each type of fish has its own name, the common characteristics or features fish share enable us to refer to them as a group by the same generic term.

Young children have many opportunities to classify concepts and words as part of their everyday lives. For example, as children become familiar with fish, they begin to develop a schema based on a set of features that fit the concept of fish. Children may learn that all fish have gills to help them breathe, fins to help them move in water, and scales on their bodies. Children then assign appropriate creatures to the fish category and, in turn, assign all features of that category to types of fish with which they are unfamiliar. Children also can discover the ways different types of fish are alike and different. These out-of-school experiences form a foundation on which primary grade children can draw as they begin to classify words that share common features. By helping children categorize and classify, teachers aid in developing schemata for future use in extending and refining word meanings.

Semantic-Based Instructional Strategies

The importance of prior knowledge and the way it is stored and retrieved have provided the theoretical bases and the impetus for instructional practices that draw on students' own experiences to facilitate comprehension. Key factors in successful vocabulary instruction include the use of semantic or affective relationships between the target words and previously acquired vocabulary (Beck, Perfetti, & McKeown, 1982) and the degree to which active and deep processing are encouraged (Mezynski, 1983). Mezynski suggests that words are best remembered when instruction is broad, processing is deep, and interaction takes place. McKeown et

al. (1985) found that rich vocabulary instruction, in which students interact with words and their meanings by comparing and contrasting words to discover their relationships, results in higher-order processing.

The strategies of semantic mapping and semantic feature analysis capitalize on broad instruction by involving both contextual and definitional approaches to vocabulary instruction and by developing semantic relationships among significant concepts (Bos et al., 1989; Stahl, 1986; Stahl & Fairbanks, 1986). Stahl explains that when students generate a semantic map or analyze a word by semantic features, they are "making the word their own" by interacting with it and by creating a novel synthesis of the new word and known information. This deep level of processing is facilitated through class discussion, which Stahl identifies as an important element of effective vocabulary instruction. Stahl points out that involving students in discussion not only requires them to process a word's meaning more thoroughly but can also motivate further vocabulary learning and provide an opportunity for students to build on one another's knowledge.

Classification plays a key role in relating new knowledge to existing knowledge. In fact, how we perceive stimuli depends on how they are categorized in terms of other stimuli rather than on their absolute structure (Rosenfield, 1988). We classify objects by comparing them on the basis of our prior knowledge, noting how they are alike and different. Because our experiences and knowledge are stored in the brain in networks, information is most accessible when learning strategies are keyed to the categorical nature of memory. Classification exercises have been identified as among the most effective activities in developmental vocabulary programs (Johnson, 1984).

Semantic mapping and semantic feature analysis provide a meaningful link between students' prior knowledge and new information presented in school environments. These two strategies build on the concepts and schemata already present in students' memory structures and draw their strength from the activation of students' prior knowledge. Encouraging students to examine the properties of words and to explore word relationships helps them organize and categorize both the concepts being learned and the words that name them. Semantic mapping and semantic feature analysis encourage students to become active readers by triggering the brain to retrieve what is known about the topic and to use this information in reading. Thus, these strategies provide meaningful alternatives to the traditional vocabulary building and reading activities typically included in basal reading series. (A complete description of the semantic mapping procedure is presented in *Semantic Mapping: Classroom Applications*, Heimlich & Pittelman, 1986.)

Overview of the Semantic Feature Analysis Process

Like semantic mapping, semantic feature analysis is a semantic-based instructional strategy for vocabulary development that takes advantage of the way the brain organizes information. SFA focuses on the ways words within a category are alike and different, helping students improve their vocabulary and categorization skills while fostering an ability to identify the relationships among concepts (Johnson & Pearson, 1984). Each of the conceptually related words has characteristics or features that distinguish it from the other words. The comparison process employed in SFA helps elucidate these shades of meaning.

Figure 1

SFA Grid for Tools

	Features						
Tools	pounds	cuts	grips	used with wood	used with cloth	used with dirt	has handle
hammer	+	–	–	+	–	–	+
saw	–	+	–	+	–	–	+
scissors	–	+	–	–	+	–	+
pliers	–	–	+	+	–	–	+
hoe	–	+	–	–	–	+	+

Adapted from *Three Sound Strategies for Vocabulary Development* by Dale D. Johnson, No. 3 of the Ginn Occasional Papers. © copyright 1983 by Ginn and Company. Used by permission of Silver, Burdett & Ginn Inc.

The SFA procedure entails developing a chart or grid to help analyze similarities and differences among related concepts. A topic or category is selected, and words related to that topic are listed in a column down the left side of the chart. In the grid for Tools (Figure 1), the list includes hammer, saw, scissors, pliers, and hoe. Features or characteristics shared by some of the words in the column are written across the top of the chart. In this case, these features include pounds, cuts, grips, used with wood, used with cloth, used with dirt, and has handle. Each word in the column is analyzed feature by feature, and pluses (+) and minuses (–) are added to the grid to

indicate which features each word possesses. For the word *hammer*, for instance, a plus would be written for the features pounds, used with wood, and has handle, while a minus would be entered for cuts, grips, used with cloth, and used with dirt. Students are then encouraged to add additional words and features to the grid for further analysis.

Semantic feature analysis helps students develop semantic precision in their reading and writing. By examining the completed grid, students can see that no two words have identical patterns of pluses and minuses. Class discussion of the grid expands students' knowledge of the words and helps them understand that no two words are identical. The discussion component is integral to the exercise.

This strategy presents vocabulary in a logical, classified way. The grids display relationships among words as well as the finer nuances within and among concepts. Students use the grids as vehicles to relate new vocabulary words to their own prior knowledge by diagraming how a new word is related to those already in their cognitive domain.

SFA has been used with whole classes and in small groups, as well as by individual students who independently develop and complete grids as a study aid or a prewriting technique. Teachers have reported that the problem-solving and discussion components of the strategy promote an atmosphere of cooperative learning.

The Effectiveness of Semantic Feature Analysis

Formal studies evaluating the effectiveness of SFA have supported its use as an instructional strategy. In a study conducted with more than 1,000 fourth through sixth grade students, Toms-Bronowski (1983) found that children who learned target vocabulary words using semantic feature analysis and semantic mapping significantly outperformed students who learned the words through contextual analysis; semantic feature analysis was the most effective of the three strategies. A test of vocabulary retention administered a month later supported the original finding (Johnson, Toms-Bronowski, & Pittelman, 1982).

A study conducted in China confirmed the strategy's usefulness. More than 1,500 children in fourth, fifth, and sixth grades were taught target vocabulary words using semantic feature analysis, semantic mapping, and the conventional Chinese memory drill approach, which focuses on the meanings, pronunciation, and writing of the Chinese characters. All three strategies produced strong improvement in performance between the vocabulary pretest and the comprehensive vocabulary posttest (Johnson et al., 1982). While the conventional Chinese method proved to be the most effective for teaching vocabulary, this effect may be attributed to the nature of the Chinese written language.

Johnson et al. (1984) compared the effectiveness of SFA with that of semantic mapping and a modified basal approach (including definitions, sentence writing, and cloze activities) for both vocabulary-acquisition and passage comprehension with students in 13 fourth grade classes. All three prereading treatments were effective in teaching target vocabulary words; SFA and semantic mapping also improved comprehension.

The use of SFA in content area classes also has been supported by research. Anders, Bos, and Filip (1984) found the strategy successful with learning disabled students who were experiencing reading comprehension difficulties in content area classes. Tenth and eleventh grade social studies students used either semantic feature analysis or the more traditional procedure of looking up difficult words in the dictionary and writing a definition and a sentence for each word. The students who used SFA did significantly better than the control group on both content vocabulary and reading comprehension tests. Furthermore, in a follow-up study conducted 6 months later, the students who had been instructed through SFA continued to outperform the control group on the comprehension test, showing no significant loss of information between the initial and the follow-up test (Bos et al., 1985).

A third study, also involving learning disabled high school students, compared SFA with a direct instruction strategy in which students were drilled on important words, their definitions, and synonyms through oral recitation. Students who were instructed through SFA performed significantly better on vocabulary and reading comprehension measures (Anders et al., 1985).

Encouraged by these results, Anders, Bos, and Wilde (1986) conducted a study to evaluate the effectiveness of SFA with junior high students of mixed academic abilities. Preliminary findings indicated that gains in reading comprehension and vocabulary acquisition, as measured by a multiple-choice test, were significantly greater for students instructed through SFA than for those who either participated in dictionary activities or memorized definitions through drill and practice.

The benefits of SFA have been further validated by Berglund and Berglund (1987, 1989), who used the strategy in ninth grade science classes. They found semantic feature analysis to be a valuable tool in helping both students and teachers determine students' depth of understanding of science and related concepts.

In summary, research strongly supports the use of semantic feature analysis in vocabulary development, prereading instruction, and content area instruction. In addition, evidence suggests that this technique is effective with learners of diverse ages, ethnic backgrounds, and reading abilities.

Semantic Feature Analysis As an Instructional Strategy

Semantic feature analysis has been used successfully to promote vocabulary development in a wide variety of classroom situations. Educators and researchers frequently cite it as an effective method of teaching vocabulary (Anders & Bos, 1986; Anders, Bos, & Filip, 1984; Anders et al., 1985; Berglund & Berglund, 1987, 1989; Beyersdorfer & Schauer, 1989; Blachowicz, 1986; Bos et al., 1985; Burns, Roe, & Ross, 1988; Cunningham & Cunningham, 1987; Gahn, 1989; Johnson & Pearson, 1984; Johnson et al., 1984; Johnson, Toms-Bronowski, & Pittelman, 1982; Lamb & Arnold, 1988; Nagy, 1988; Pittelman & Heimlich, 1991; Searfoss & Readence, 1989; Stahl, 1986; Stieglitz & Stieglitz, 1981; Tierney, Readence, & Dishner, 1990).

A recent survey of 34 reading methods textbooks published since 1984 confirmed that SFA is a frequently recommended strategy for vocabulary development (Berglund & Heimlich, 1989). The most commonly recommended applications were 1) content area instruction, 2) postreading instruction, and 3) activating background knowledge prior to reading. Recent use by classroom teachers has demonstrated the strategy's adaptability for use as a prewriting activity (Berglund & Heimlich). In addition, SFA has been adapted for use with microcomputers in content area instruction. These findings highlight the need for teachers to become familiar with implementing SFA in a variety of instructional contexts.

Although the basic steps of the semantic feature analysis procedure are essentially the same for each application, the instructional focus of the lesson will vary with the teaching objective. In content area instruction, SFA is frequently used to teach technical terms and concepts as well as to focus students' attention on specific concepts. As part of a postreading lesson, the strategy may be used to compare and contrast key concepts presented in the text, to review key vocabulary, or to facilitate character

analysis. In a prewriting application, SFA often is used to identify and clarify ideas that will form the basis of the student's composition.

This chapter presents a brief overview of each of these applications, as well as of variations such as use with microcomputers. Detailed descriptions of lessons teachers have developed using semantic feature analysis are presented in Chapter 3.

The Semantic Feature Analysis Procedure

As noted earlier, semantic feature analysis is an effective procedure for demonstrating the relationships among concepts within a category as well as the uniqueness of each word. Through the procedure, students improve their vocabulary and categorization skills by building on their existing schemata. They also develop semantic precision as they come to realize that even with very similar words, the patterns of pluses and minuses eventually become different when enough semantic features have been considered. Students, therefore, come to realize that rarely do two words have exactly the same meaning and that the word *synonym* most often refers to "something like" rather than "the same as."

As students fill in a word grid, they learn new words within a category and become aware of semantic features they may not have previously considered. Discussion is an integral part of the procedure. As students examine and discuss the grid, they make comparative judgments about words. For the strategy to be most effective, the students rather than the teacher should note the similarities and differences. The discussion also provides students with opportunities to relate the new vocabulary to their own experiences and to expand their existing schemata.

The general procedure for a semantic feature analysis lesson follows.

1. *Select a category.* Semantic feature analysis grids can be constructed for most categories of words. When students are being introduced to the SFA procedure, however, it is best to select categories that are concrete and familiar. Examples of good categories for introducing the SFA procedure include Tools, Pets, and Fruits. As students become familiar with the technique, more abstract categories such as Government, Communication, and Feelings can be used. The topic of the SFA grid in Figure 2, Vehicles, was selected by the teacher because it related to a classroom unit of study.

2. *List words in the category.* Down the left side of a large piece of chart paper (or a chalkboard or an overhead transparency), list

Figure 2

Classroom SFA Grid for Vehicles

Vehicles \ Features	two wheels	four wheels	more than four wheels	motor	diesel fuel	gasoline	people power	handlebars	passengers	enclosed	used on land	used on water			
car	−	+	−	+	−	+	−	−	+	+	+	−			
bicycle	+	−	−	−	−	−	+	+	−	−	+	−			
motorcycle	+	−	−	+	−	+	−	+	+	−	+	−			
truck	−	−	+	+	+	+	−	−	+	+	+	−			
train	−	−	+	+	+	−	−	−	+	+	+	−			
skateboard	−	+	−	−	−	−	+	−	−	−	+	−			
rowboat	−	−	−	−	−	−	+	−	+	−	−	+			
sailboat	−	−	−	−	−	−	−	−	+	−	−	+			
motorboat	−	−	−	+	−	+	−	−	+	−	−	+			

two or three words that name concepts or objects related to the category. These words should be familiar to the students. In the sample grid, the teacher first listed car, bicycle, and motorcycle.

3. *List and add features.* In a row across the top of the chart, list three or four features (traits, properties, or characteristics) shared by some of the words. Ask students to suggest additional features that at least one of the words usually possesses, and add these to the row of features. For most categories, the list of features will be quite extensive. At this point in the lesson, start with only a few features, and allow students to add more later. In the sample SFA grid, the initial features were two wheels, four wheels, more than four wheels, motor, diesel fuel, and gasoline.

4. *Determine feature possession.* Guide students through the matrix, asking them to decide whether each of the words listed down the left side of the grid typically possesses each of the features listed across the top. Although many features of a word are not truly dichotomous, use the plus sign to indicate that the word usually or substantially possesses the feature, and a minus sign if it does not. In the SFA grid for Vehicles, for example, a plus sign is used to indicate that cars typically use gasoline, even though some cars use diesel fuel. When students are not sure whether a word possesses a certain feature, a question mark can be entered on the grid. The question mark serves as a placeholder and helps to focus discussion and guide students' investigation of those points that require further study or clarification.

5. *Add more words and features.* Ask students to suggest additional words that fit the category as well as other features that apply to the words listed. As suggestions are offered, add them to the semantic feature analysis grid. Expanding the matrix helps students increase their vocabularies and further develop their categorization skills. The more students are actively involved in the selection of words and features to be analyzed, the more effective the strategy will be. In most cases, you will run out of space or time before students run out of features or words. It might be necessary to set a time limit or to restrict the number of additions to the grid. For some SFA lessons, limiting the number of entries on the grid is an excellent way to help students learn how to focus on the important features of a topic.

6. *Complete the grid.* Direct students to complete the grid by adding pluses, minuses, or question marks. Suggest that they use reference materials to verify their answers.

7. *Examine and discuss the grid.* Encourage students to examine the completed grid carefully, noting the similarities and differences among the words in the category. For example, in the grid for Vehicles, it can be noted that even though rowboat, sailboat, and motorboat are different, they share some similar traits. As the same time, the three are different from the other vehicles listed because they are the only ones that operate on water. Give the students an opportunity to discuss these kinds of observations about the category items. Guide them in making generalizations about the words in the category as well as in discerning what makes each word unique. Remember, the procedure is most effective when the students – not the teacher – observe the similarities and differences.

These seven steps outline the basic procedure for using SFA. The lesson may end after the students examine and discuss the completed grid, or the lesson may serve as a motivational tool for further exploration and study. Many teachers have found that as students examine a grid, they become interested in learning more about the concepts. Some of the students in the class that developed the Vehicles grid, for example, became curious about the features that would differentiate the various types of boats. Types of boats they added to their grid included yachts, houseboats, kayaks, hydrofoils, and pontoon boats. Then they did research to find the features that distinguish these boats from one another.

The first few times the SFA strategy is used, it is important for the teacher to model the process and show students how to analyze the words or concepts by features, focusing on the various relationships among the words. After students are familiar with the procedure, the teacher can act as a facilitator, guiding their completion and analysis of the grid. As students become proficient in this activity, they will be able to take an active role in planning the organization of the grid and in selecting the words and features to be compared.

The symbols used to complete a grid can be easily adapted to meet the needs of individual classrooms. While Johnson and Pearson (1984) originally recommended the use of plus and minus signs, smiling and sad faces or the letters *Y* (yes) and *N* (no) also can be used when adapting the procedure for use with young children. As students become more familiar with the procedure and develop more sophisticated learning skills, the letters *A* (almost always), *N* (almost never), and *S* (sometimes) or a numeric intensity scale can replace the pluses and minuses. These more sophisticated notation systems allow students to indicate the relative degree of feature possession and permit even greater precision. For example, on the grid

for Vehicles the letter *S* could be used to indicate that sometimes cars use diesel fuel and sometimes sailboats have motors. Using a number scale of 1 to 5 would enable students to recognize the intensity of relationships among words. A number scale is used to complete the SFA grid on Shelters (see Figure 3). Using the number scale of 1 to 5 (with 1 representing "not at all" and 5 representing "extremely"), a class ranked various kinds of shelters in terms of a given feature. For example, a palace and a castle are extremely large; a hovel is not large at all; and a house, a cabin, and a shack fall between the two extremes.

An SFA grid can be as inclusive or exclusive as the teaching objective dictates. In some lessons, for example, it may be beneficial for students to brainstorm as many related concepts and features as they can think of,

Figure 3

Classroom SFA Grid for Shelters

	large	small	ornate	simple	sparse	expensive
palace	5	1	5	1	1	5
hovel	1	5	1	5	5	1
cabin	3	3	2	4	3	3
castle	5	1	4	2	2	5
house	4	2	3	3	2	4
shack	2	4	1	5	5	2

while in other instances, limiting the grid may help students to focus on the key features that distinguish one concept from another.

Semantic Feature Analysis in Content Area Instruction

Teachers readily recognize that successful instruction in the content areas depends on student mastery of key concepts and vocabulary. One of the major difficulties with learning in the content areas is that students constantly encounter words and concepts outside their personal frames of reference. To be effective, vocabulary instruction should help students incorporate this new information into existing schemata, forming a link between the new and the known.

Sometimes, the primary goal of instruction is to teach students more "efficient" labels for previously acquired concepts. For example, children may be taught the words *fuchsia*, *mauve*, and *lavender* as clarification or extensions of *purple*. Frequently, however, the technical vocabulary introduced in content material represents labels for unfamiliar concepts. In order to learn the new vocabulary, students must either modify existing schemata or develop additional schemata so that new information can be assimilated. A fourth grade child being introduced to the words *prism* and *spectrum* as part of a science unit on light may have to modify or build on existing schemata for *light* in order to be able to incorporate information about how color is produced

One of the content area teacher's primary responsibilities is to structure classroom situations that lead to the development of new concepts or schemata. Teachers must carefully consider unfamiliar vocabulary in content area lessons in which the vocabulary load could affect a student's ability to comprehend the facts, concepts, and principles of the subject matter. With SFA, high-encounter words as well as technical vocabulary crucial for comprehension can be presented before students are expected to recognize them in reading or use them in writing. Attention can be directed toward helping students to identify and understand the terms that will assist them in comprehending new information.

Traditionally, vocabulary instruction in the content areas has consisted of directing students to define, memorize, and then use the new words in sentences (Vacca, Vacca, & Gove, 1987). But in order for students to learn new words well enough to improve their comprehension of written materials, they must have multiple opportunities to build both conceptual and contextual knowledge of the words and to relate this new knowledge to their background knowledge.

The SFA procedure provides content area teachers with a systematic way of helping students to explore, organize, and reinforce what they are learning about the new concepts, as well as the words that name them. It

encourages students to become active readers by activating prior knowledge – a process that plays a key role in the comprehension of content material. When a specific concept is activated, the entire memory structure for that concept is reawakened and becomes available to facilitate the incorporation of new material in the comprehension process.

While developing a class grid, students question one another and defend their answers. For many classes, this represents a change in the traditional interaction pattern. In order to decide how to mark the grid or how to justify their decisions, students synthesize their background knowledge with information from the text. This process stimulates students to think about the topic and motivates them to become actively involved in their learning. Another benefit is that by listening to the discussion and watching as students complete the grid, teachers become aware of any misconceptions students may have and are alerted to the need to reteach certain concepts.

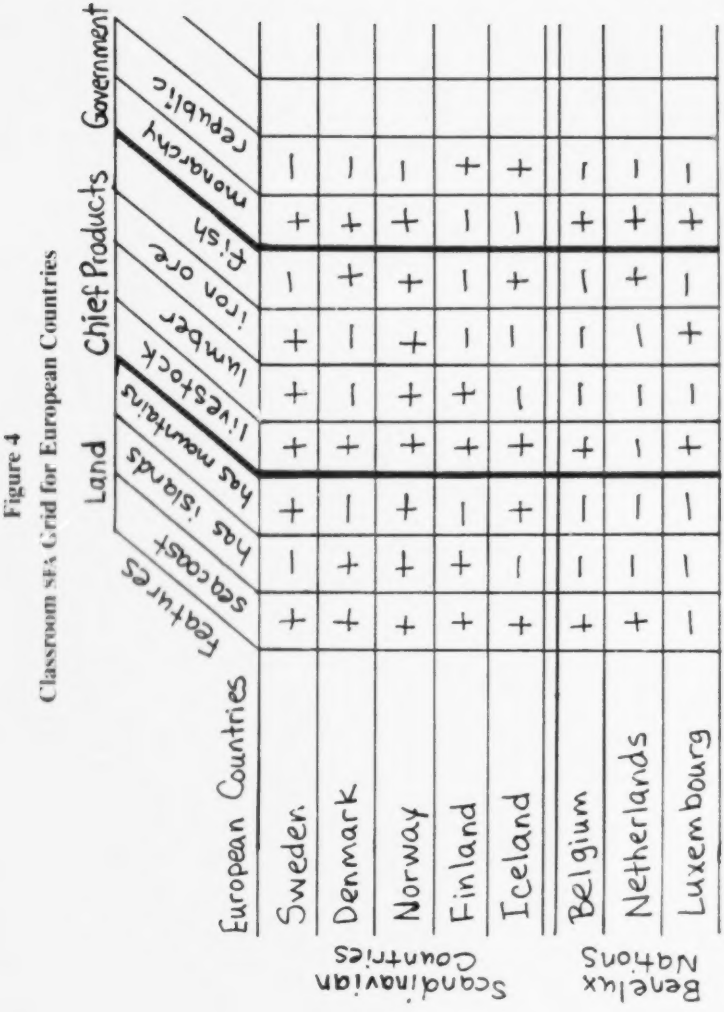
An SFA grid is an effective and efficient way to organize content material. It provides an easily assimilated graphic representation of information being studied. Throughout a unit of study, students independently can develop a grid, including information derived from class presentations and reading. This grid can serve as a valuable independent study aid.

The semantic feature analysis grid on European Countries, presented in Figure 4, was generated by a sixth grade class as part of its study of Europe. As information was presented and discussed, students added new categories and features to the grid, which then served as a basis for a summary discussion of the Scandinavian and Benelux countries. Each student was given a copy of the classroom grid to use in studying for the unit test. The teacher planned to have the class develop the grid further as countries in other areas of Europe were studied later in the year.

Semantic feature analysis forms the basis of the Subject Area Vocabulary Reinforcement (SAVOR) procedure, which is an increasingly popular approach to vocabulary instruction (Berglund & Berglund, 1987). The SAVOR process was developed to reinforce essential vocabulary and important concepts in the content areas (Stieglitz & Stieglitz, 1981). While the procedure employed is basically the same as that used in standard SFA lessons, SAVOR is viewed as a reinforcement strategy to be used only when students already have knowledge of the topic. Therefore, it is most appropriately used as a culminating unit activity.

Like standard semantic feature analysis, SAVOR seeks to lead students beyond simple memorization of word meanings. It requires students to examine the relationships among vocabulary words and concepts so they internalize the words critical to their understanding of major concepts in the content area. Students are encouraged to use textbooks, class notes, and

Figure 4
Classroom SAVOR Grid for European Countries



reference materials to defend their entries on the grid. In using SAVOR in science classes, Berglund and Berglund found that students spontaneously referred to multiple resources to verify their positions. SAVOR also can be a useful assessment technique, enabling the content area teacher to determine student misconceptions and lack of understanding of the topic.

Stieglitz and Stieglitz note that when the discussion makes such misconceptions apparent, teachers should provide additional instruction to ensure that the concepts are fully mastered.

Semantic Feature Analysis in Reading Instruction

Semantic feature analysis encourages students' acquisition of literate behaviors in developmental reading programs. SFA is most commonly used as a postreading activity, as well as during the actual reading process. It also can be an effective prereading strategy, especially when the text selection contains content area materials.

As a prereading activity, SFA can be used to activate students' prior knowledge and to introduce key vocabulary words. It helps students focus on relevant schemata, preparing them to understand, evaluate, and assimilate the information they are going to read. It also facilitates reading comprehension by helping students integrate the material to be read with their own experiences, prior knowledge, and attitudes. Developing an SFA grid stimulates students' interest in the topic, motivating them to read the material. In addition, the procedure can serve as an informal assessment of students' knowledge about a topic and may alert the teacher to the need for additional prereading experiences. Figure 5 is a grid that was developed by a first grade class in the Midwest prior to reading a selection about seasons from a basal reader.

As a postreading activity, SFA helps students refine and elaborate on concepts introduced before reading. During the postreading activity, students have an opportunity to add to or modify items on the prereading grid. Through class discussion, students can identify and integrate new information. The class discussion also can serve as a comprehension check for the teacher.

Frequently, stories in basal readers are grouped into thematic units. Figure 6 presents a grid that a class developed to compare the main characters in the stories in the basal unit, *Daring to Try*. Discussing each character's traits was an important feature of the lesson.

Semantic feature analysis is an effective means of helping students develop an understanding of what they know about a collection of readings. Students may form small groups and identify several features on which to compare the selections. After the groups complete their work, they may present their findings to the class. As they compare and contrast the stories in a unit, students gain firsthand experience in problem solving and decision making. This group work motivates students and provides positive interaction with other group members.

Figure 5

Classroom Prereading SEA Grid for Seasons

Seasons	Features: school starts	leaves turn pretty colors	bare trees	green leaves	snow	rain	green grass	flowers bloom	birds fly south	robins return		
fall	+	+	−	+	−	+	+	+	+	−		
winter	−	−	+	−	+	−	−	−	+	−		
spring	−	−	−	+	−	+	+	+	−	+		
summer	−	−	−	+	−	+	+	+	−	−		

Figure 6

Classroom Postreading SFA Grid for Basal Unit *Daring to Try*

Daring to Try

Characters	Traits: gained independence	overcame fear	saved a life	learned to compromise	solved another problem	was brave	was wise	was courageous	was stubborn	was trained for the job
Eva	+	+	−	−	−	+	+	+	−	+
Linda	+	+	+	−	+	+	+	+	−	+
Mary Jo	+	+	+	−	+	+	+	+	−	−
Queen Calliope	−	−	−	+	−	−	+	−	−	−
King Pilaf	−	−	−	+	−	−	−	−	−	−
Great-Aunt Pippa	−	−	+	−	+	+	+	+	+	−

Semantic Feature Analysis in Integrated Reading/Writing Instruction

Semantic feature analysis presents teachers with an opportunity to integrate students' reading and writing experiences. Learning reading and writing collaboratively and interactively helps build on students' literacy skills and enables them to further develop the literate behaviors necessary for successful school experiences. Hoffman and Heath (1986) define literacy as the ability to tell what text means, to link the material to personal experience, to compare similarities and differences among ideas in several texts, to make logical predictions and hypotheses, and to talk meaningfully about what has been read.

As children think and talk through the creation of an SFA grid, they have effectively participated in the prewriting phase of the writing process. The next step could be to lead them into writing. The discussions during the development of the grid, as well as the grid itself, help facilitate successful writing experiences. The grid provides the organizational structure around which children can develop paragraphs about the topic, and serves as a ready reminder of the ideas that may be included in the development of writing. A variety of writing forms, including descriptions, riddles, and questions, can be developed easily from the information on an SFA grid.

Several prewriting strategies based on semantic feature analysis have been developed recently (Beyersdorfer & Schauer, 1989; Gahn, 1989; Simpson, Stahl, & Hayes, 1989). The Predict, Organize, Rehearse, Practice, and Evaluate (PORPE) procedure is particularly effective in encouraging writing in the content areas. Gahn (1989), using a planet matrix, suggests the following steps to implement the PORPE procedure:

1. The teacher displays a matrix skeleton (an SFA grid) for a topic. For example, the matrix skeleton for Planets would include the names of planets and some of their distinguishing features (see Figure 7).
2. The students complete the grid (add pluses and minuses) using their personal knowledge of the topic, leaving blanks to indicate areas of uncertainty.
3. The students read the text to confirm their answers and to fill in any blanks remaining in the matrix. When disagreements arise, the students read statements from the text to defend their answers.
4. Using the completed matrix, the teacher asks the class to develop a sentence about one of the planets (e.g., Venus) on the grid.
5. The teacher displays a model paragraph and discusses the use of

Figure 7

Prewriting SFA Grid for Planets

Planets in Earth's solar system

	Closer to sun than Earth	Larger than Earth	Has moon	Has rings	Orbits the sun	Inner planet
Earth	–	–	+	–	+	+
Jupiter	–	+	+	–		–
Mars		–	+	–	+	+
Mercury	+	–		–	+	+
Neptune	–	+		–		–
Pluto	–	+		–		–
Saturn	–	+		+		–
Uranus	–			–		–
Venus	+	–	+	–	+	

From P. Cunningham & J. Cunningham, Content area reading-writing lessons. *The Reading Teacher*, February 1987, p. 509.

the topic sentence, three sentences supplying details, and the concluding sentence.

6. The students then divide into small groups to write a detailed paragraph about another planet listed on the grid.
7. As students become more skilled at writing, the paragraph assignment can be extended to a one-page composition.

Participating in the development of a semantic feature analysis grid and then using the information generated helps students organize their thoughts and gather needed data. By easing the transition from oral to written language, SFA can help to build positive attitudes toward writing. Sharing their compositions with others will help students develop their oral reading and descriptive writing abilities. SFA can be a valuable tool in developing literate behaviors in the areas of reading and writing and can be easily adapted to a variety of language arts situations.

Semantic Feature Analysis with Computer Assisted Instruction

Microcomputers have become a common tool in reading and writing programs. Microcomputer database programs can help facilitate SFA lessons by providing an efficient and relatively easy way to create a grid and compare its entries.

As Johnson and Pearson (1984) note, the SFA procedure typically requires a lot of paper or chalkboard space. If a grid becomes extremely complicated or extensive, teachers may run out of space before their students run out of words or features. Furthermore, it might be difficult to focus the discussion on specific words or concepts if the terms being compared for a feature become visually separated. Using a microcomputer database program to develop and generate SFA grids is a creative solution to this problem. In addition, this application of microcomputers is highly motivating for both students and teachers (French & Cook, 1987).

Database programs such as Scholastic *PFS:File* and *PFS:Report* or Broderbund *Bank Street School Filer* simplify the process of adapting a database program for SFA. A database program allows a computer user to store, organize, and retrieve information or data. The basic units in database files are records and entry fields. Each record can be thought of as an index card in a file box; each entry field can be compared to a category of information on the index card (e.g., name, address, phone number).

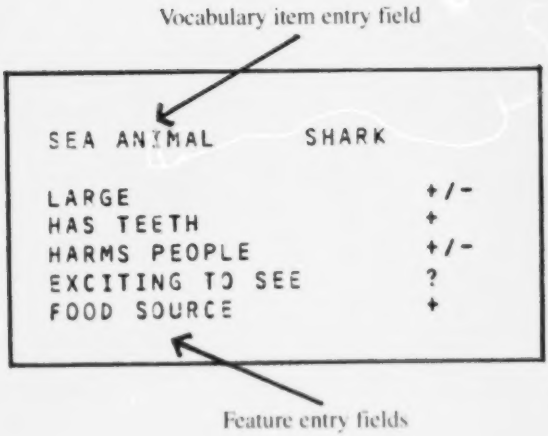
A database file can be developed to store a variety of information, such as names and addresses, states and capitals, and pupils and test scores. In a semantic feature database file, each record is made up of a vocabulary item entry field (which contains the target vocabulary word) and feature entry fields, in which the semantic features are listed. A sample format for a semantic feature database record for Sea Life is presented in Figure 8. The target vocabulary word is *shark*; the feature entry fields are listed beneath it.

Developing a semantic feature database file can provide students with a positive cooperative learning experience. The procedure for using a computer to create an SFA grid begins in the same manner as the traditional SFA procedure. An outline of a lesson in which a semantic feature database was developed by a fourth grade class for the topic Sea Life follows:

1. The teacher and students determine the subject of the semantic database and brainstorm a preliminary grid of the vocabulary words and features on large chart paper, a chalkboard, or an overhead transparency.
2. Once the organization of the grid has been determined – that is, once some of the vocabulary words and features are identified –

Figure 8

Format for an SEA Database Record for Sea Life



the framework for the database file is entered into the computer, using a software program such as *PFS:File* (an information management program with comprehensive filing, sorting, and searching capabilities). In setting up the database, the first field for each record is designated as the vocabulary item entry field (e.g., sea animal). The remaining entry fields are used to store the features.

3. Using a large monitor, the format for the semantic grid is presented to students. For Sea Life, the first entry field is sea animal, and the word *shark* is entered. The features for shark suggested by the class are listed beneath it (e.g., large, has teeth). Then the teacher shows the students how to enter the (+) and (-) indicators for each feature. A mixed (+/-) symbol may be used if the answer is variable (for instance, some types of sharks harm people, while others don't).
4. Each student is assigned a sea animal and given a copy of the *PFS:File* format. Then the students are instructed to evaluate the features for that sea animal, recording the pluses and minuses on

a sheet of paper. As each child completes the assignment, he or she enters the information into the computer.

5. When all the information has been entered, the program *PFS:Report* is used to generate the SFA grid. Because *PFS:Report* can generate a maximum of nine columns, the class must decide which features are the most critical and should be included in each grid. The completed semantic feature grid for the lesson on Sea Life is shown in Figure 9.

6. After the grid is displayed, the students and teachers can sort through the file, calling onto the screen the sea animals that have or do not have specified features, and print out reports that present the file in a grid format that focuses on those key features.

There are several advantages to using microcomputer database programs to develop SFA grids. The first is *retrievability*. Once a semantic feature database file is created, it can be saved indefinitely. The same information can be used repeatedly with different objectives. A second advantage is *speed*. Once the file is created, searching for and retrieving information on specified criteria and then developing the grids can occur very quickly. Students can contrast information in several different ways without having to use large amounts of class time. A third advantage is *motivation*. In developing computer-generated SFA grids in a sixth grade classroom, French and Cook (1987) found that students were highly motivated to search for information to enter into the semantic database files. Students worked together in groups with great effectiveness.

Computer applications of SFA are not without some limitations. Obviously, teachers must have some computer skills, as well as access to a microcomputer. Furthermore, the sophistication of the searches and of the grids produced will vary with the software used. Hunter (1985) recommends that teachers working with database programs use more than one monitor so that students can work in groups.

Despite these limited concerns, the microcomputer can be a valuable tool in teaching vocabulary lessons using SFA. By developing semantic feature database files, teachers can combine the effectiveness of semantic feature analysis with the power of the microcomputer.

Figure 9
Computer-Generated SFA
Grid for Sea Life

SEA ANIMAL	HAS TEETH	STINGS	FINS	HAS POUCH	SWIMS	PINCHES	HARMS PEOPLE	HAS GILLS
CRAB	-	-	-	-	+	+	?	+
DOLPHIN	+	-	+	-	+	-	-	-
EEL	+	+/-	+	-	+	-	+/-	+
LOBSTER	-	-	-	-	+	+	-	+
SEA HORSE	-	-	+	+	+	-	-	+
SEA SNAKE	+	-	-	-	+	-	+	+
SHARK	+	-	+	-	+	-	+/-	+
WHALE	+	-	+	-	+	-	?	-

Classroom Applications of Semantic Feature Analysis

Several applications of the SFA procedure were discussed in the previous chapter, including content area instruction, reading instruction, integrated reading/writing instruction, and computer applications. Teachers have found that the basic SFA procedure can be modified easily and adapted to meet their specific classroom objectives.

In this chapter, we present 8 lessons illustrating a range of applications of the semantic feature analysis procedure. These lessons, selected from a pool of more than 100, demonstrate the useability and flexibility of this strategy in elementary and middle school classrooms. Students participating in the lessons ranged from kindergarten through eighth grade; most lessons were developed for whole class participation, although small group applications also are included. These sample plans are based on written documentation as well as on teacher interviews.

A semantic feature analysis grid is presented in Figure 10 to highlight the important elements of the eight classroom applications. By glancing at the grid, the reader quickly can see how the SFA procedure is used in each lesson. Comments are included at the end of each lesson to highlight the unique contributions of the SFA procedure in meeting the teachers' instructional objectives. Also included is information that will help teachers adapt the lesson to the needs of their own students. Reproductions of the SFA grids are provided for each lesson, and a blank SFA matrix is included at the end of the chapter to assist teachers in creating a grid for their own SFA lessons.

Figure 10

Composite SFA Grid

Classroom Applications	Purpose: develop vocabulary	Purpose: stimulate interest	Purpose: organize information	Purpose: promote discussion	Purpose: develop new concepts	Purpose: review/refine concepts	Purpose: develop independent study aid	Purpose: assess knowledge	SFA Emphasis: postreading	SFA Emphasis: prewriting	SFA Emphasis: literature	SFA Emphasis: content area	SFA Emphasis: computer-assisted instruction	Instructional Group: whole class	Instructional Group: small group/pairs	Instructional Group: individual
Social Studies: 7th grade	+	+	+	+	–	+	+	–	+	–	–	+	–	+	–	+
Mathematics: 5th grade	+	+	+	+	+	+	–	+	+	–	–	+	–	+	–	+
Music: 4th grade	+	+	+	+	–	+	–	–	–	–	–	+	–	+	–	–
Science: Kindergarten	+	+	+	+	+	+	–	+	–	–	–	+	–	+	–	–
Children's Lit.: 3rd grade	+	+	+	+	–	+	–	–	+	+	+	–	–	+	+	–
Language Arts: 2nd grade	+	+	+	+	+	+	–	–	–	+	–	–	–	+	–	+
Language Arts: 6th grade	+	+	+	+	+	+	–	–	+	+	+	–	–	+	–	+
Science: 8th grade	+	+	+	+	+	+	–	–	+	–	–	+	+	+	+	–

Content Area SFA Lessons

Social Studies: Grade Seven

In this application, semantic feature analysis is used as a study skill procedure with a high-average seventh grade class. The SFA lesson was used at the conclusion of the unit on early civilizations in order to prepare students for the end-of-unit test. The procedure assisted students in reviewing and retrieving the vast amount of information presented in the unit, and helped them to organize it in a useful fashion. (See Figure 11.)

Objectives

- Retrieve information.
- Highlight the similarities and differences among early civilizations.
- Review key vocabulary terms related to the unit.
- Develop a graphic study tool.

Procedure

Day 1

1. Draw a grid on an overhead transparency, chalkboard, or large sheet of chart paper.
2. Write Early Civilizations at the top of the left hand column. Along the top of the grid, write Features.
3. Ask students to recall the various early civilizations the class has studied in the unit (e.g., Roman, Egyptian). As students suggest the civilizations, list them down the left side of the grid.
4. Ask students to suggest features or characteristics of early civilizations (e.g., educated, monotheism, slavery). As each feature is mentioned, list it at the top of the grid.
5. Review the procedure for completing a grid by explaining to the students that if a civilization had a specific characteristic, they should put a plus in the box; if the characteristic did not apply to that civilization, they should put a minus in the box. Remind the students that if they are not sure, or if the class cannot agree on a rating, a question mark should be used.
6. Have the class help you fill in the appropriate marks for the first civilization listed on the grid (Roman). For each feature, discuss

Figure 11

SFA Grid for Early Civilizations

Early Civilizations	educated	monotheism	slavery	democratic	monarchy	naval power	baths	agriculture	builders	traders	theater	warlike
Roman	+	−	+	−	+	?	+	+	+	+	+	+
Egyptian	+	−	+	−	+	+	+	+	+	+	?	−
Viking	−	−	+	−	+	+	−	−	−	?	−	+
Greek	+	−	+	+	−	?	+	−	+	+	+	−
Frank	−	−	+	−	+	−	−	+	−	−	−	+
Assyrian	+	−	+	−	+	−	+	−	+	−	−	+
Anglo-Saxon	−	−	+	−	+	+	−	+	−	−	−	+
Byzantine	+	+	+	−	+	−	+	+	+	+	+	−
Moslem	+	+	+	−	+	−	+	+	+	+	+	+
Hun	−	−	+	−	+	−	−	−	−	−	−	+

with the class whether there should be a plus, a minus, or a question mark in the box.

7. Distribute copies of a blank grid to students and have them copy the civilizations and the features onto their grids.
8. Instruct the students to use their notes and textbooks and work independently to complete the grid for the remaining civilizations. Encourage the students to add features they think would apply to any of the civilizations.

Day 2

1. Display the initial grid on the overhead projector, chalkboard, or chart. Review each civilization by asking students to share whether they had filled in a plus, minus, or question mark for each feature.
2. Encourage discussion about the responses, guiding the students to defend their decisions in cases of disagreement.
3. As responses are shared and consensus is reached, record the responses on the master grid. Provide an opportunity for students to modify their own grids as necessary.
4. Ask the students to share any additional features they have identified. Through discussion, have the class fill in the appropriate marks for each new feature.
5. Using the semantic feature analysis grid as a base, help students to generalize the similarities and differences among the civilizations.
6. Encourage students to use the completed grid as a study tool.

Comments

The students had no difficulty identifying the characteristics of the civilizations they had studied. In fact, the teacher reported that the students generated so many additional features on Day 2 that he had to help them limit the number of features to add to the grid. He commented that the process of limiting the number of features forced students to decide which features highlighted the major differences among the civilizations. It should be noted that the teacher allowed sufficient time for thorough discussion of all features. This provided him with an opportunity to clarify key concepts and to identify and correct any misconceptions students had.

The teacher was pleased with the lesson. Not only did it accomplish the objectives of reviewing key vocabulary and highlighting the similarities and differences among early civilizations, but it actively involved the stu-

dents through the process. He noted that the SFA procedure seemed to foster a cooperative learning environment in the classroom and encourage students to listen to one another. On Day 2, students were eager to share their responses and see if other students agreed with their ratings. The teacher commented that the students enjoyed the "authority status" they achieved when they used research to defend their decision on how to mark the grid. He also reported an additional benefit of the lesson: students viewed the completed grid as a valuable study tool and used it to prepare for the exam.

As an alternative to working independently to complete their grids (Steps 7 & 8), the students may work cooperatively in pairs or in small groups. It should be noted, however, that discussion is an important component of the SFA procedure. Regardless of how students use the strategy, an opportunity for discussion should be provided so they can share and compare the information on their grids.

Mathematics: Grade Five

In this application, semantic feature analysis is used with a fifth grade mathematics class. The students had just completed a geometry unit on polygons. The SFA grid was developed as a way of summarizing and reviewing the information about the geometric figures introduced during the unit. (See Figure 12.)

Objectives

- Review the attributes of each geometric figure presented during the unit.
- Reinforce information about polygons and their attributes.
- Compare and contrast geometric figures.

Procedure

Day 1

1. Draw a grid on the chalkboard. At the top of the column on the left, write Polygons. Along the top of the grid, write Features.
2. Ask the students to name the polygons they have studied (e.g., triangle, rectangle, quadrilateral). As they name each figure, list it down the left side of the grid.
3. Ask students to think of words that describe the geometric figures, and explain that these descriptive words are called *features*.
4. As students suggest features (e.g., plane figure, straight sides, four sides and four vertices), write them at the top of the grid.

Figure 12

Classroom SFA Grid for Polygons

Polygons / Features	plane figure	straight sides	4sides & 4vertices	4sides & 4right angles	closed figure	all sides have equal length	2 pairs of opposite sides have equal length	2 pairs of opposite sides are parallel	3sides & 3vertices	5sides & 5vertices	8sides & 8vertices	6sides & 6vertices
triangle	A	A	N	N	A	S	N	N	A	N	N	N
rectangle	A	A	A	A	A	S	A	A	N	N	N	N
quadrilateral	A	A	A	S	A	S	S	S	N	N	N	N
square	A	A	A	A	A	A	A	A	N	N	N	N
hexagon	A	A	N	N	A	S	S	S	N	N	N	A
octagon	A	A	N	N	A	S	S	S	N	N	A	N
pentagon	A	A	N	N	A	S	S	S	N	A	N	N
parallelogram	A	A	A	S	A	S	A	A	N	N	N	N

A=always N=never S=sometimes

5. Beginning with the first geometric figure on the list (triangle), have the students decide whether each of the features listed across the top of the grid always describes that figure. If the feature always applies, write an *A* in the grid under that attribute. If the feature never applies, write an *N* in the grid. If the feature sometimes, but not always, applies, write an *S* on the grid (for instance, some quadrilaterals have four sides and four right angles, and some don't).
6. After the class has put the appropriate markings on the grid for the first three shapes listed, distribute copies of a blank grid and direct the students to copy the names of the figures and the features onto their grids. Then give them an opportunity to work independently to complete the markings for each of the features listed.
7. After the students have completed their grids, have them share their marks. If students disagree about which letter is appropriate, have them defend their answers and encourage them to draw examples.
8. After the chalkboard grid has been completed, use the information as a springboard for group discussion. Ask students questions about geometric figures: "What figure has three sides?" "Which features do all polygons share?" "How are rectangles and parallelograms alike, and how are they different?"
9. Give the students opportunities to create additional questions that can be answered by the information on the grid.

Comments

This example illustrates the benefit of using SFA to review terms that often are confused with one another. The grid provided a visual representation of the features or attributes of each geometric figure, enabling students to see quickly and easily how the figures they were studying are alike and different. The teacher reported that the grid was an ideal tool "to help a very confused class deal with the sometimes close definitions of figure geometry." She felt that the lesson was much more successful than the more traditional approach of having students list the words and write their definitions. She commented that listening to the students' discussions as they were deciding how to fill in the grid gave her an opportunity to assess the children's knowledge of the mathematical concepts being presented.

The grid also served as a springboard to stimulate further thought and the development of more advanced mathematical concepts. The teacher reported, for example, that the students could not decide whether

all the sides of a triangle are of equal length. The teacher encouraged students to draw figures to defend their statements. This led to a discussion of the different types of triangles and their various properties. Similarly, there was considerable debate as to whether the sides of a pentagon had to be of equal length, prompting the teacher to introduce the concept of a regular pentagon. The teacher remarked that marking the features "2 pairs of opposite sides have equal length" and "2 pairs of opposite sides are parallel" was especially challenging and initiated a great deal of discussion. She confessed that her first instinct was to explain that these features did not apply to some of the polygons and to use an NA (not applicable) to complete the grid. However, she challenged her students to think about whether these features – typically used to describe 4-sided polygons – could, in fact, apply to more complex figures. She was surprised at how involved the children became in drawing figures to prove their hypotheses.

Music: Grade Four

In this application, SFA is used with a fourth grade general music class. The class, which was just completing a unit of study on stringed instruments, used the grid as a means of summarizing three types of information: how sounds are produced, in which musical groups stringed instruments would participate, and whether an instrument is played in the treble clef, bass clef, or both. (See Figure 13.) The students then used the completed grid as they listened to musical selections and tried to determine which stringed instruments they heard.

Objectives

- Identify the instruments of the string family.
- Recognize each instrument aurally.
- Identify the playing techniques used to produce sound on each instrument.
- Identify the types of musical performance groups in which the instruments participate.
- Categorize the instrument according to the primary range existing in the treble or bass clef.
- Increase music vocabulary.

Procedure

Day 1

1. Draw a grid on the chalkboard. At the top of the left hand column, write Stringed Instruments. Along the top of the grid

Figure 13

Classroom SFA Grid for Stringed Instruments

Stringed Instruments	Features: use bow	strum	hit	pick	use keys	Musical Groups: rock	orchestral	country	jazz	chamber	concert band	Clef: 𝄞	𝄢
piano	N	N	A	N	A	S	S	S	A	S	S	A	A
harp	N	S	N	S	N	N	S	N	N	S	S	A	A
violin	A	N	N	S	N	S	A	A	N	S	N	A	N
guitar	N	S	N	S	N	A	N	A	S	S	N	A	S
bass	S	N	N	S	N	A	A	A	A	S	S	N	A
cello	A	N	N	S	N	N	A	N	N	S	N	N	A
ukelele	N	S	N	S	N	N	N	N	N	S	A	A	N
banjo	N	S	N	S	N	N	N	A	N	S	N	A	N
harpsichord	N	N	N	A	A	N	S	N	N	S	N	A	A

A = almost always N = almost never S = sometimes

write Features. Tell students they are going to use this grid to review what they have learned about stringed instruments.

2. Ask students to try to remember all of the instruments in the string family. As they suggest instruments, list them down the left side of the grid (e.g., piano, harp, violin).
3. Write Sound Production along the top of the grid. Then ask students to think of all the ways sounds are produced on stringed instruments (e.g., use bow, strum, pick). Record these across the top of the grid.
4. Tell students that during their next music class they will have an opportunity to identify playing techniques for each instrument and to record that information on the grid.

Day 2

1. Review with the students the instruments and sound production methods listed on the grid. Ask students whether they would like to add any other stringed instruments to the grid and whether they can think of any additional ways that sounds are produced on these instruments. Add these instruments and techniques to the grid.
2. Tell students they are going to decide which playing techniques are used for each of the instruments and whether the techniques are used almost always, sometimes, or almost never. Tell students you are going to enter an *A* on the grid if the instrument almost always uses that playing technique, an *N* if the technique is almost never used, and an *S* if the technique is only sometimes used.
3. Beginning with the first instrument listed on the left side of the grid (piano), have students decide which letter to fill in for each of the techniques listed. For the example piano, an *N* should be entered for bow, strum, and pick, and an *A* for hit and use keys. Continue this procedure for each of the instruments listed on the grid. (When students are uncertain or cannot agree on the playing technique, demonstrate how the instrument is played.)

Day 3

1. Tell the students they are going to have an opportunity to discuss the musical groups that include stringed instruments and to add this information to the grid. Write Musical Groups across the top of the grid.

2. Ask students to look at the list of stringed instruments and to think of types of musical groups that might include at least one of these instruments. Record students' responses across the top of the grid.
3. Through discussion, complete the grid by writing *A* (almost always), *N* (almost never), or *S* (sometimes) under each musical group for each instrument. Review the markings on the grid to determine if any of the musical groups never use stringed instruments. If so, erase these groups from the grid.
4. Using the information on the grid, help students to develop some generalities concerning the use of stringed instruments. For example, ask them to determine whether any stringed instruments are used in all musical groups, which instruments are used in only a few groups, which groups use several types of stringed instruments, and which groups include only a few.

Day 4

1. Draw a treble and bass clef along the top of the grid and write Clef above them. Review the function of each clef on the musical staff. Explain that higher pitched instruments play notes written in the treble clef and lower pitched instruments usually play notes written in the bass clef.
2. Tell students they are going to decide if an instrument is played in the treble clef, bass clef, or both, and record the information on the grid. Explain that if the instrument is almost always played in the clef being discussed, an *A* should be recorded; if it is almost never played in that clef, an *N* should be written, and if it is sometimes played in that clef, an *S* should be recorded.
3. When all the instruments have been discussed, have students look at the grid and determine which instruments are higher pitched, which are lower pitched, and which can be played in both clefs.

Day 5

1. Tell the students that today they will use the completed grid to help them as they listen to excerpts played by musical groups using stringed instruments.
2. Inform the class that you are going to play selections from different types of musical groups, including an orchestral, a jazz, and a country selection. Explain that, before each selection, the stu-

dents should use the grid to help in deciding which stringed instruments they expect to hear in the selection and how the sound will be produced for each instrument in that group.

3. As they listen, direct them to list each stringed instrument they hear and how the sound is produced on that instrument (e.g., guitar – strum; cello – pick).
4. After each selection, have students share the lists of instruments they identified and the ways in which the sound was produced for each instrument.

Comments

The teacher who used this series of lessons reported that the students progressed to a deeper level of discussion and achieved greater understanding than would normally have resulted from traditional fourth grade music lessons. The SFA grid provided the students with a visual listing of the playing techniques used for each instrument, which helped them become more discriminating listeners. For example, as students listened to a violin being played, they identified not only the instrument but also the playing technique being used. The grid also helped students anticipate the instrumentation of a given ensemble, before hearing the performance. (For example, for a country western band, students anticipated hearing a bass, guitar, banjo, and violin.)

Categorizing the instruments by usage of musical clef helped students develop a heightened awareness of musical scoring. The grid facilitated a discussion relating clef usage to instrument range (high or low), instrumental size (small to large), and musical usage (melody, harmony, bass line). The grid also stimulated students' interest in musical terminology throughout the series of lessons. For example, musical terms dealing with sound production (e.g., pizzicato, muted, bowing, glissando) were discussed and demonstrated.

A valuable outcome of using an SFA grid in music was helping students become aware that there are exceptions in music. For example, although the students marked *A* for playing the piano with keys, a few comtemporary works call for the performer to pluck the strings under the lid. With the exception of the piano, all instruments were marked *N* for being hit, yet specific compositions may ask violinists to strike their instruments with their bows. Since these were exceptions, the class determined they would categorize instruments according to their normal usage. These exceptions brought about interesting discussion and broadening of minds concerning the use of traditional instruments in contemporary music.

SFA proved to be an excellent teaching and summary technique for general music class. Each student was encouraged to participate in activities that involved critical thinking, predicting, and analyzing. Other teachers were excited when they saw the SFA grid being used in the music classroom and expressed an interest in using the procedure in their own classrooms.

Science: Kindergarten

In this application, semantic feature analysis is used in a kindergarten class in conjunction with a science lesson on the food groups. As part of the unit, children made a classroom collage with pictures of fruits, and studied and tasted a variety of fruits. The class developed an SFA grid at the beginning of the unit and added to it throughout the unit. The grid helped the children remember the features of each type of fruit and assisted them in distinguishing among the various fruits being studied. (See Figure 14.)

Objectives

- Reinforce and develop concepts about a variety of fruits.
- Develop an awareness of the similarities and differences among fruits.
- Organize and record the information being learned.
- Improve listening skills.

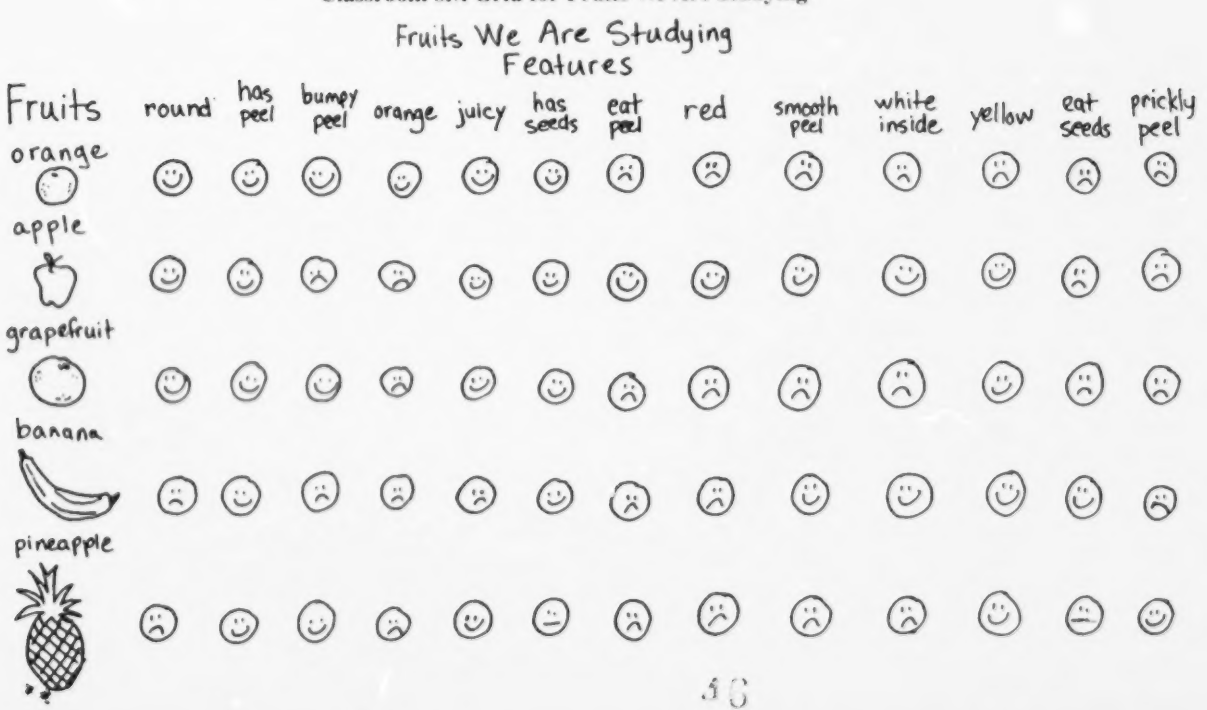
Procedure

Day 1

1. Help the children to create a classroom collage using pictures of fruit they have cut from magazines.
2. Review the names of the fruits on the collage.
3. Explain to the children that they are going to make a special kind of chart to help them think about the fruits they will be tasting.
4. Along the top of a large piece of paper, write Fruits We Are Studying and help the children read the title.
5. On the left side of the paper, write Fruits. Then write orange underneath. To help children remember what the word says, draw a picture of an orange under the word.
6. Explain to the children that you are going to make a special kind

Figure 14

Classroom SFA Grid for Fruits We Are Studying



of chart to help them share what they know about fruits and that you are going to write words (features) that describe fruits. Write Features along the top of the chart (SFA grid.)

7. Hold up an orange and ask the class to describe it. (It may be helpful to ask questions, such as, "What shape is the orange?" "What is on the outside of the orange to protect it?" "Is the peel smooth or bumpy?" "Do you eat the peel?")
8. As the children describe the orange, write each feature they suggest along the top of the chart (e.g., round, has a peel, bumpy peel, orange).
9. To encourage additional descriptive words, cut open the orange. Then ask the children to suggest other words to describe the orange. (Suggestions might include juicy or has seeds.) Add their suggestions to the top of the chart.
10. Explain to the children that now you are going to read the words written along the top of the chart. If the feature describes an orange, a smiling face should be drawn in the appropriate space; if it does not apply to an orange, a sad face should be drawn. If there is disagreement or uncertainty, draw a face with a straight mouth. Then read each feature, giving different children opportunities to draw the face.
11. Hold up an apple. Write apple on the list of fruits on the chart and draw a picture of an apple under the word.
12. Tell the children to think about the features of an apple and whether it has any of the same features as the orange. Then read aloud each feature written on the SFA grid. As you read a feature, ask the children whether it describes an apple, and whether a smiling face or a sad face belongs in the space under the feature.
13. After the children have discussed each of the features, ask them to suggest other words that describe an apple. To stimulate discussion, cut the apple open. As the students suggest each new feature, add it to the chart and have a child draw the appropriate face.
14. Distribute pieces of apple and orange for each student to taste. After the students have eaten the fruit, ask them for additional words to add to the chart.

Other Days

Encourage students to bring fruits from home. Group the fruits in ways that highlight their attributes. For example, grapefruit, banana, and pineapple can be introduced on one day. The features discussed could include eat the peel, eat the seeds, yellow, prickly, and smooth. On another day, pears, peaches, and grapes can be compared, adding the features fuzzy skin, pit, and grows in bunches.

Comments

In this lesson, SFA was used with very young children, most of whom were not yet able to read. By drawing pictures of the fruits under the words and using smiling and frowning faces as the symbols to mark the grid, the teacher was able to simplify the procedure and make it a meaningful experience for kindergartners.

The teacher reported that in the initial discussions, children's comments about the fruits tended to be very general. As children were asked to assign attributes to each fruit, they began to focus their attention and be more discriminating about which characteristics they attributed to each fruit.

The SFA grid provided the teacher with a means of determining which children were grasping the concepts that had been introduced. She commented that in the past she had assumed that all children understood the similarities and differences among the various fruits, but she had had no strategy to evaluate the accuracy of this assumption. During the discussion of how to mark the grid, the teacher was able to determine which children understood the concepts.

In addition to the information children learned about fruits, the students were introduced to and used new vocabulary words within a meaningful context, learned to record their own ideas in an organized fashion, and learned to "read" an SFA grid. In addition, the grid was a motivating factor that served both to focus the children's attention and to maintain their interest during the lesson and for many weeks. Displaying the completed grid in the classroom provided opportunities for review and for additional checks on children's grasp of the concepts that had been introduced. Several weeks after the unit was completed, the children continued to discuss which fruits had the most characteristics on the grid.

Reading Instruction SFA Lesson

Children's Literature: Grade Three

In this example, SFA is used with third grade students as they read a trade book. The teacher guided the students through their reading of *Now*

One Foot, Now the Other, written by Tomie dePaola (1981). The book describes the efforts of a boy who helps his grandfather regain his ability to walk and talk after he has suffered a debilitating stroke. The students identified traits of the characters and wrote *Y* (yes) on the grid if a character possessed a trait and *N* (no) if the character did not. Next they compared and contrasted the two major characters in the story. Working cooperatively in pairs, students used the completed SFA grid to assist them in writing two paragraphs, one that discussed ways in which the characters are alike and one that discusses how they are different. (See Figure 15.)

Objectives

- Identify traits of main characters in the story.
- Organize and structure information regarding character traits.
- Compare the two main characters.
- Discuss and summarize the character traits in preparation for writing paragraphs about the characters' similarities and differences.
- Write, edit, and revise the paragraphs.

Procedure

Day 1

1. Tell students they are going to read a book about a boy and his grandfather. Introduce the book title, *Now One Foot, Now the Other* and the author, Tomie dePaola.
2. Using the book title and the picture of the grandfather and grandson on the cover, ask students to predict what the book might be about. Write their predictions on the chalkboard.
3. Guide students through the reading of the book, stopping at appropriate points to discuss how grandfather Bob and his grandson Bobby are alike and how they are different.
4. When students have completed the book, discuss their initial predictions in light of the book's actual contents. Confirm or reject the predictions.
5. Tell the students they are going to develop a special kind of grid or chart that will help them see how the grandfather and grandson are alike and how they are different.
6. Draw a grid on the chalkboard and along the top of the grid write, *Now One Foot, Now the Other.* Then write the names of the two major characters, Bob and Bobby, down the left side.
7. Ask students to suggest character traits that describe Bob and/or

Figure 15

Classroom SEA Grid for *Now One Foot, Now the Other*

Now One Foot, Now the Other

Characters \ Traits	old	kind	sick	big	likes to tell stories	likes building blocks	helpful	laughs	scared	shares	sad	likes to teach	can walk at beginning of story	can walk at middle of story	can walk at end of story
Bob	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
Bobby	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y

Y=yes N=no

Bobby (e.g., old, kind, sick, big). Write these traits across the top of the grid.

8. As each feature is written, ask students if it applies to each of the characters. Write *Y* in the grid if the character possesses the feature and *N* if the character does not. This will highlight ways in which the characters are alike and different.
9. Using the grid as a visual aid, help students to verbalize how the two characters are alike and how they are different.

Day 2

1. Review the character comparison grid with the students.
2. Tell the students they are going to have an opportunity to work with a classmate to write two paragraphs about the characters: one paragraph should discuss the ways in which the characters are alike, and the other how they are different.
3. Have students form pairs and work with their partners to plan and discuss what they are going to include in each paragraph. (Encourage them to use the grid during their discussions.)
4. After each pair has completed this prewriting activity, have them write and edit their paragraphs.
5. When students have completed editing their paragraphs, direct them to exchange their work with another pair so they can review one another's paragraphs and discuss possible revisions.
6. Each pair should make the appropriate revisions and then prepare a final copy of their paragraphs.
7. Give students an opportunity to read their paragraphs aloud in class.

Comments

In this example, SFA was used successfully as an integral part of a reading lesson. In addition to motivating the students to identify the character traits that describe the main characters in the story, listing these traits on the grid provided students with a systematic and easy method with which to compare the two characters.

The teacher reported that the procedure was extremely effective in preparing the students for the writing phase of the lesson. Students who previously had been hesitant to write had a positive attitude about this assignment because the grid provided them with an organized way in which to structure their paragraphs. Furthermore, because most of the vocabulary

the students needed to write their paragraphs appeared on the grid, they were not distracted by spelling problems in their writing. Students were surprised at how easily they were able to complete their writing assignment and were proud to read aloud their completed paragraphs.

The SFA grid also helped to structure the cooperative writing experience. The visual aid helped students in discussing the development of each paragraph and was a valuable tool when students reviewed one another's work during the editing process.

Integrated Reading/Writing SFA Lessons

Language Arts: Grade Two

In this application, semantic feature analysis is used as a prewriting exercise with second grade students. A parent of one of the students brought an 8-week-old kitten into the class. After the kitten left the classroom, the students used the SFA grid to summarize what they knew about kittens, and then extended the grid to include information about other pets. The students then used the information on the grid to create riddles about pets and shared their riddles with one another. (See Figure 16.)

Objectives

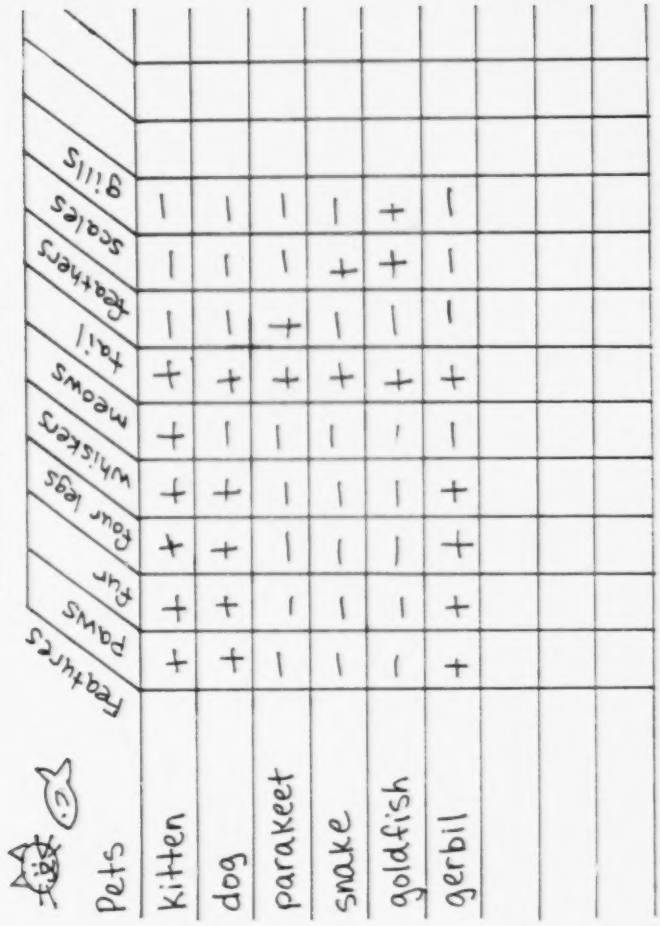
- Help students describe the kitten.
- Activate background knowledge about pets.
- Organize and structure information about pets.
- Help students use information from the grid to develop clues and to write riddles.
- Increase students' vocabularies.

Procedure

Day 1

1. Give the children an opportunity to hold and observe the kitten. Encourage the class to ask questions of the kitten's owner, such as, "How old is the kitten?" "What does he eat?" "What are his favorite toys?"
2. After the owner and the kitten leave, encourage the children to describe the kitten and discuss its behaviors.
3. Draw a semantic feature analysis grid on the chalkboard.
4. Write Pets at the top of the left column of the grid. Write kitten on the first line.

Figure 16
Classroom SEA Grid for Pets



5. Ask children to suggest words that describe the kitten. Explain that these descriptions are called features. Then write Features along the top of the grid.
6. List the features the children suggest (e.g., paws, whiskers, tail) along the top of the grid.
7. Ask the children to suggest other pets (e.g., dog, parakeet, snake) and list them on the grid under kitten.

8. Invite children to suggest features that describe these animals and write them along the top of the grid.
9. Tell the students that they are going to have an opportunity to fill in the boxes on the grid with either a plus if the animal has the feature, or a minus if it doesn't.
10. Starting with the kitten, discuss each of the features listed across the grid and put the appropriate marks in the box.
11. For each of the remaining pets listed on the grid, invite individual children to come to the board and record the pluses and minuses as suggested by the group.

Day 2

1. Review the SFA grid the class developed for Pets.
2. Encourage children to add additional pets and features and then discuss which mark to use to complete the grid.
3. Using the information on the completed grid, discuss the similarities and differences among the pets listed. Ask the class questions such as, "Which animals have paws?" "Which animals have scales?" "How are a kitten and a dog different?" "How are they alike?"
4. Tell the class they will have an opportunity to use the information on the grid to write riddles. Explain that each box gives them information to use in writing a clue about the animal of their choice.
5. Show children how to use the information from the grid to create a riddle about pets. For example, "I have paws, fur, and whiskers but do not meow. What am I?" or "I have a tail and scales but not gills. What am I?" Explain to the children that to write a good riddle, they will need to select features that several animals share and include at least one feature the animal does not share.
6. Give children the opportunity to share a few riddles orally and then let them exchange riddles and try to solve them.

Comments

In this example, SFA was used to organize information from a classroom experience and then expand that framework by incorporating other experiences and information. The teacher reported that starting with a shared classroom experience (the kitten's visit) and then moving to the more abstract idea of pets in general made the SFA procedure easy to learn

and use. The children thought of the filling in of the grid as a game and participated eagerly. The teacher said that even later in the week, students continued to tell her other animals that could have been choices and suggest features that would make them different from those on the grid. She remarked, "When you have a way to keep students' minds active and thinking all day, it must be worthwhile. We'll do it again soon."

The completed classroom grid provided an easy way for students to create the clues for the riddles they wrote. Having pluses and minuses on the grid helped students to include information in their clues about features the animals did and did not have, making the riddles more challenging. Because clues were so easy to generate from the grid, students did not have difficulty getting started. The teacher commented that everyone got involved in the activity and there was a feeling of excitement in the classroom as riddles were created and shared.

Language Arts: Grade Six

In this application, SFA is used with a class of sixth grade students as they read *Sarah, Plain and Tall* by Patricia MacLachlan (1985). This Newbery Award-winning book tells the story of Sarah, a mail-order bride who leaves her home in Maine to live on the plains with a widower and his two children. She becomes very lonely for the coast and has to decide where she wants to settle. As students read the story, they develop an SFA grid to identify the characters in the story and the emotions each is experiencing.

Objectives

- Guide reading of the book.
- Identify central characters.
- Associate specific feelings and emotions with individual characters.
- Develop a prewriting guide.

Procedure

Day 1

1. Tell the students that over the next few days they will be reading a book entitled *Sarah, Plain and Tall*. Explain that this story is about a family that writes letters to a mail-order bride.
2. Introduce the concept of a mail-order bride. Discuss how people can use letter writing to express their feelings as well as to learn about one another. Tell the children that in the story a family cor-

responds with a woman named Sarah, and that as they read the story, they will have an opportunity to pretend they are one of the characters and to write a letter.

3. Help students to locate on a map the Plains states and Maine. Briefly describe the physical characteristics of each setting, contrasting the seacoast of Maine to the prairies of the Plains.
4. Ask the students to read the first two chapters of the book.

Day 2

1. Tell the students that they are going to be using a special kind of chart, called a semantic feature analysis grid, to identify the main characters in the story and to discuss each character's feelings.
2. Using an overhead projector, display a transparency of a blank SFA grid. At the top of the grid, write the title *Sarah, Plain and Tall*. Ask the children to name the characters in the story and write the names along the top of the grid.
3. Tell the children that you are going to write words that describe how Papa (Jacob), Anna, Caleb, and Sarah feel during the first two chapters. For example, Anna, Caleb, and Papa are sad and lonesome. Write these words down the left side of the grid.
4. Brainstorm with the students to identify additional words that describe each character's feelings and add them to the list on the left side of the grid.
5. Ask the children to think about which emotions each character may have felt during the first two chapters. Tell the children that you are going to fill in a plus under a character's name if the feelings applies, and a minus if the feeling does not describe that character's emotions. If the story does not give enough information, use a question mark.
6. Review each emotion listed and give various children opportunities to write the plus sign, minus sign, or question mark in the appropriate box. (See Figure 17.)
7. Explain to the children that they will have opportunities to add additional feelings to the grid as they continue to read the story.
8. Tell the students to read the third chapter of the story, reminding them that as they read, they should try to identify the feelings the characters may be experiencing.

9. After the children have finished reading the third chapter, ask them to suggest additional feelings that could be added to the grid. As each feeling is suggested, list it down the left side of the grid, using a different colored marker from that used to list the characters' feelings during the first two chapters of the story. As an emotion is listed, a plus, minus, or question mark should be written in the box under each character's name.
10. Referring to the markings on the grid, have the class summarize the feelings each character experienced in the first three chapters, pointing out the changes in feelings between the second and third chapter. Tell children they will have an opportunity to write a letter in the voice of the character they choose.

Day 3

1. Discuss the letters the characters in the story wrote to one another during the first two chapters. Ask the children to point out examples of how the information and feelings expressed in the letters helped to prepare the characters for Sarah's arrival in Chapter 3.
2. Using the grid as a guide, review the feelings each character experienced while corresponding with one another during the first two chapters of the book.
3. Explain to the children that now they will have a chance to pretend to be one of the characters in the first two chapters (before Sarah arrives) and to write a letter to another character in the story.
4. Tell the children to use the information on the grid to recall how each character was feeling at the time he or she was corresponding.
5. Give students an opportunity to write the first drafts of their letters.

Day 4

1. Ask students to read and edit the drafts of their letters. Then give them an opportunity to prepare final copies.
2. After they have completed their letters, give each student an envelope to address to the appropriate character. For the return address, tell the student to put his or her own name, as well as the

Figure 17

Classroom SFA Grid Developed After Chapters 1 and 2 of *Sarah, Plain and Tall*

Sarah, Plain and Tall

Feelings	Characters: Anna	Caleb	Papa	Sarah
sad	+	+	+	?
lonesome	+	+	+	?
anxious	+	+	+	+
anticipating	+	+	+	+
curious	+	+	+	+
worried	+	+	—	—
happy	+	+	+	?

name of the character he or she pretended to be when writing the letter.

3. Let the students "mail" their letters by putting them in a "mailbox."

Day 5

1. Randomly deliver a letter to each student in the class.
2. After the students read their letters, give them an opportunity to write a response letter pretending to be the character to whom the original letter was addressed. Have students use the information

on the grid to assist them in recalling how that character was feeling.

3. When the students have completed their letters, have them address the envelope. Tell them to write the name of the story character to whom the letter is written as well as the name of the pupil who wrote the original letter. (This information was in the return address of the envelope they had received.)

Day 6

1. Deliver the response letters to the appropriate students and give them an opportunity to read and to share them. (Figure 18 shows a set of letters that students wrote and exchanged.)
2. Give students time to finish reading *Sarah, Plain and Tall*.

Day 7

After students have finished reading the book, use a marker of a third color to list on the grid additional emotions the characters experienced throughout the rest of the story.

Comments

In this application, an SFA grid was incorporated into an integrated reading/writing lesson to facilitate student discussion about the story and to provide a prewriting organizer. By using an overhead transparency, the teacher was able not only to elicit information from several students in the class but also to model the procedure for developing an SFA grid. In this way, students were able to gain a comprehensive understanding of the main characters and their emotions.

In completing the letter writing exercise and the SFA grid, students demonstrated an ability to assume another person's point of view by taking on the identity of a character in the story. The teacher reported that the students enjoyed "becoming" the characters and that the experience of writing the letters helped them develop a deeper appreciation of how the characters in the story were feeling.

A Semantic Feature Database Lesson

Science: Grade Eight

In this example, an eighth grade class participates in a SFA lesson as part of a science unit on trees. Semantic feature analysis is used in conjunc-

Figure 18

Student Letters for *Sarah, Plain and Tall*

March 3, 1848

Dear Sarah,

Hello. My name is Caleb William Whitting. I am 8 years old. You wrote to my father about coming to become our new mother. I also have a sister. Her name is Anna. We have 2 dogs, 2 horses, and lots of cows. We live on a farm in Kansas. Will you please answer some of my questions?

1. How old are you?
2. What are your favorite things to do?
3. Why do you like the ocean so much?
4. What do you do at the ocean?

Please write to me and tell me.

Sincerely,
Caleb William Whitting

P.S. I like cats even though I've never had one. ☺

March 16, 1848

Dear Caleb,

Well, to answer your questions, I am 32 years old. My favorite things to do are sew, cook, clean, and sing. I like the ocean so much because I like to watch the waves and find seashells.

I think my cat can get used to your dogs. I am anxious to see what you are like.

Sincerely,
Sarah Wheaton

tion with a database program to develop a semantic feature database file. The students worked cooperatively to research information about various trees and entered their findings into the database record. A focal point of the lesson was the class discussion, in which students compared and contrasted the trees based on the features researched. The lesson culminated with the generation of a variety of grids in order to focus attention on specific kinds of trees. (See Figure 19.)

Objectives

- Prepare students to use a microcomputer database program.
- Provide students with an objective-based research experience.
- Present information within an organized structure that facilitates making comparisons.

Procedure

Day 1

1. Through discussion, review the trees that were studied during the unit (e.g., balsam fir, ponderosa pine, western red cedar) and list them on the chalkboard.
2. Explain to students that they are going to use a microcomputer database to organize the information they have learned about the trees they've been studying.
3. Ask students to think of features or characteristics that describe the trees listed on the chalkboard and explain that these will become the entry fields of the database record. Make the first entry field, name of tree. Then, as the students suggest features, enter them into the microcomputer. (Features suggested by the class included deciduous, evergreen, and used for furniture.)
4. Review information about using the database, including entering pluses and minuses to indicate whether a tree has a specific feature.
5. Divide the students into groups and assign each group a tree to research. Explain that they need to determine whether each of the attributes or features listed in the database record applies to the tree they have been assigned. Suggest that they use other resources in addition to their science textbook (e.g., Brockman, 1986.)

Figure 19

Computer-Generated SFA Grid for Trees

	DECIDUOUS	EVERGREEN	FURNITURE	FOOD	TIMBER	PULP	ORNA-MENTAL	WIND-BREAK
AMERICAN SYCAMORE	+	-	-	-	-	-	-	-
BALSAM FIR	-	+	-	-	-	-	+	+
BLACK WALNUT	+	-	+	+	+	-	+	-
BLACK WILLOW	+	-	-	+	+	-	-	-
EASTERN COTTONWOOD	+	-	-	-	-	-	-	-
OHIO BUCKEYE	+	-	-	-	-	-	-	-
PAPER BIRCH	+	-	-	+	-	-	-	-
PECAN	+	-	-	+	-	-	-	-
PONDEROSA PINE	-	+	+	-	-	-	-	-
PUSSY WILLOW	+	-	-	-	-	-	+	-
SUGAR MAPLE	+	-	+	+	-	-	+	-
WESTERN RED CEDAR	-	+	+	-	-	-	-	-

Figure 20

SFA Database Record for Ponderosa Pine

NAME OF TREE	:	PONDEROSA PINE
DECIDUOUS	:	-
EVERGREEN	:	+
USED FOR FURNITURE	:	+
BEARS FOOD	:	-
TIMBER (LUMBER) TREE	:	+
PULP (PAPER) TREE	:	-
ORNAMENTAL TREE	:	-
WINDBREAK TREE	:	-
GOOD SHADE TREE	:	-
WHERE DOES IT GROW - REGION	:	WESTERN USA

6. As each group of students completes the research process, help them enter the name of the tree and the pluses and minuses into the database record. (See Figure 20.)

Day 2

1. Using the database, generate an SFA grid and distribute a copy to each student. (If the class identifies more features than the database program can list on a single screen, select those features you want to appear on the grid. A second grid to incorporate the remaining features can be developed and distributed to each student.) The first grid for Trees is presented in Figure 19.
2. Using the information on the grid, lead a discussion about the various attributes of the trees researched. Ask key questions such as "Which trees are used for timber?" and "Which trees are ornamental?"
3. After the students have formed generalizations about the trees they researched, focus their attention on a specific group of trees (e.g., evergreens) and use the database program to generate an SFA grid that will facilitate the comparison of evergreen trees.

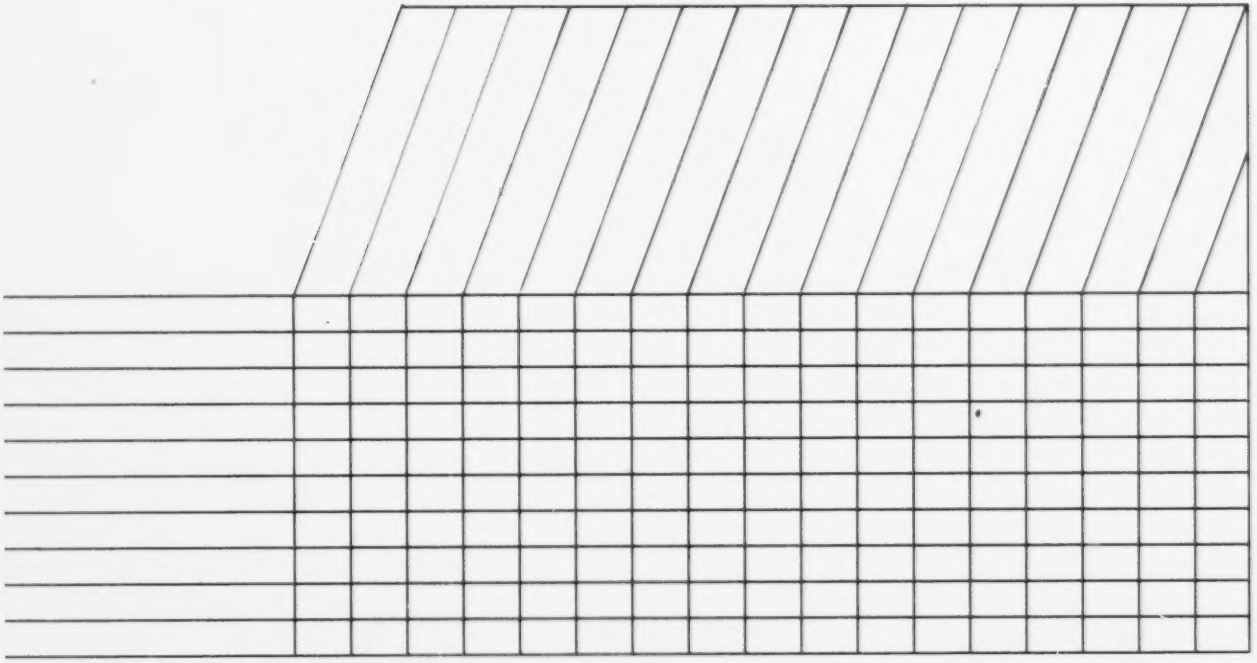
Comments

The use of semantic feature analysis with a database program motivated students to learn more about trees. The activity provided a cooperative learning experience in which students of different abilities worked together to complete the research project successfully. The students enjoyed entering their findings into the database and seeing their contributions on the completed SFA grid.

In addition, having information on a computer database enabled the teacher to generate a variety of grids in order to focus attention on specific types of trees. Students were able to contrast information in several different ways without having to use large amounts of class time.

Figure 21

A Blank SFA Grid



A Final Word

Semantic feature analysis enables students to conceptualize new knowledge and relate it to their prior knowledge. It has been shown to be an effective method for expanding vocabulary in a logical and sensible way. The SFA grid graphically represents a student's experiences and prior knowledge. While a semantic map presents a broad view of semantic relationships within a concept, the SFA grid focuses on the finer relationships between and among words.

Although semantic feature analysis was originally employed as a method of developing general vocabulary, it has proved to be a valuable strategy for content area instruction. As illustrated in the preceding classroom applications, SFA is adaptable across the content areas. It provides a simple way for students to organize, compare, and contrast information being presented. The creation of an SFA grid provides an effective review of a unit topic, and the completed grid can be a valuable study tool. Finally, as an assessment instrument, the grid presents the teacher with a clear and straightforward representation of students' knowledge and understanding of the topic. As both a pre- and postreading activity, SFA can improve reading comprehension, motivate students, and clarify concepts and relationships. Used with a trade book, for example, SFA can help students identify character relationships and emotions. As a prewriting organizer, the grid can be used to highlight relationships that are then incorporated into various forms of expository text – especially compare/contrast relationships. Teachers report that the SFA process enables students to approach their writing assignments with greater confidence.

Semantic feature analysis facilitates collaboration among students and can be modified to meet a variety of classroom approaches and organizations. A grid drawn on a chalkboard or overhead transparency can serve as the basis for a whole-class activity, while the development and completion of grids can provide a vehicle for small-group discussion and learning. Students of all abilities can work together to develop, complete, and ana-

lyze the grid. Teachers have commented that students enjoy assigning new features and completing the grid. Finally, as students become more independent and confident in their use of the technique, they can use SFA to create personal study guides.

Semantic feature analysis is fun and easy to implement. In addition, it is adaptable to a variety of learning situations and content areas. As a result, it is becoming an increasingly popular instructional technique. It has been used successfully with students of all grade levels, as well as with bilingual and learning disabled students.

Two notes of caution are needed. First, the SFA grid should be considered a tool for discussion rather than an end in itself. Teachers who use semantic feature analysis frequently comment on the high quality of student discussion the procedure elicits. Only through extended discussion, both during the development of the grid and after the grid has been completed, will students derive a full understanding of the relationships between and among the words and concepts. The more actively involved the students are, the better the strategy will work. An SFA lesson is incomplete if the discussion and analysis phases are omitted. A second cautionary note is that, as with any technique or lesson style, teachers should be careful not to overuse semantic feature analysis. If it is used with discretion, students' interest in the SFA technique will be maintained and this innovative procedure will continue to be a valuable learning tool that students can apply to a variety of learning situations.

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